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FERMENTATION CHARACTERISTICS OF STRAINS OF 'STREPTOCOCCUS MUTAN--ETC(U)
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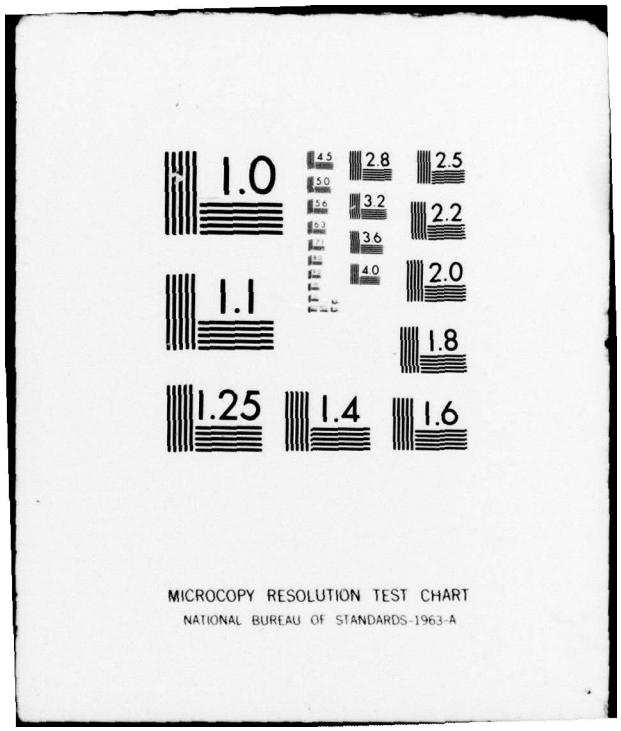
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Realization of the important role of *Streptococcus mutans* in the initiation of dental caries has resulted in extensive studies of all its biologic characteristics. The ultimate goal is to control or eliminate it from the oral cavity. One means of accomplishing this is to reduce or eliminate its carbohydrate source. This study reports those carbohydrates which *Streptococcus mutans* cannot metabolize.

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FERMENTATION CHARACTERISTICS OF STRAINS OF *Streptococcus mutans*

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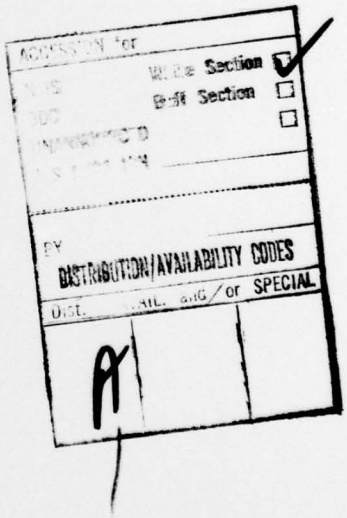
Running head: Fermentation Patterns of *S. mutans*

Synopsis

Realization of the important role of *Streptococcus mutans* in the initiation of dental caries has resulted in extensive studies of all its biologic characteristics. The ultimate goal is to control or eliminate it from the oral cavity. One means of accomplishing this is to reduce or eliminate its carbohydrate source. This study reports those carbohydrates which *Streptococcus mutans* cannot metabolize.



FERMENTATION CHARACTERISTICS OF STRAINS OF *Streptococcus mutans*

Although the role of sucrose in a number of systemic diseases is not clearly defined, there is little doubt as to its significance in the initiation and progression of dental caries (Newbrun, J. Dent. Child. 36:13-22, 1969). Among the most significant factors in this relationship is the formation of long-chain polymers of glucose (mutans) when sucrose is utilized as a carbohydrate source. The ability of *Streptococcus mutans* to produce such polymers has led to its consideration as a major etiologic agent in the initiation of a carious lesion (Loesche, et al., Inf. and Immun. 11:1252-1260, 1975). Knowledge of this particular aspect of sucrose metabolism has resulted in the search for a substitute sweetening agent. Xylitol shows great promise of being such an agent. Not only is it an effective sweetener, but recent studies suggest that it prevents initiation of the carious process (Scheimer, et al., Acta Odontol. Scand. 32:383-412, 1974). However, as the result of a report which suggested that it may have carcinogenic potential, studies within the United States have been stopped. Thus, until further evidence is available concerning this aspect of the metabolism of xylitol, it seems advisable to consider the overall carbohydrate fermentation characteristics of *S. mutans*. Such information may broaden the range of sweeteners which could be used as sucrose substitutes.

Included in this study were the following strains of *S. mutans:* HS6, AHT, and E49 (serotype a); FA-1 (serotype b); NCTC 10449 (serotype c); and S1-1 and 6715-10 (serotype d). Each liter of fermentation medium contained 20g trypticase, 2.0g K_2HPO_4, 0.01g $MgSO_4.7H_2O$, and 20g of sugar,

with pH adjusted to 6.8. Sugars which could not be autoclaved were filter sterilized (see Table). Control tubes contained no sugar. All tubes were incubated at 37°C for 14 days. After reaching room temperature, tubes were shaken well and pH was measured using a Beckman pH meter. Unless otherwise indicated, readings represent an average of two tubes.

The findings (Table) indicate that all strains failed to utilize arabinose, glycerol, inositol, and melezitose as carbohydrate sources. Using only strains 10449, HS-6, and FA-1, the study was expanded to include cellobiose, galactose, maltose, mannose, melibiose, rhamnose, trehalose, and xylose. These strains failed to ferment rhamnose and xylose.

Of the carbohydrates which *S. mutans* failed to ferment, only glycerol is currently used as a commercial sweetener. Consideration should be given to the use of one, or a combination of the other sugars, i.e., arbinose, inositol, melezitose, rhamnose, or xylose, as sucrose substitutes.

FERMENTATION CHARACTERISTICS OF STRAINS OF *S. mutans*

Strains of *S. mutans*	Arabinose*,**	Glucose**	Glycerol	Isoitol	Inulin	Lactose	Mannitol	Melezitose	Raffinose	Salicin	d Sorbitol	Starch
HS 6 **	6.4	4.6	7.2	7.3	5.1	5.0	4.8	6.7	5.0	5.1	5.3	5.6
AHT	6.6	4.5	6.9	6.8	4.4	4.5	4.6	6.9	4.5	4.6	4.6	5.5
E 49	6.4	4.5	7.0	6.8	4.7	4.7	4.8	7.0	4.8	4.6	4.8	6.0
FA 1	6.7	4.5	7.0	7.3	4.7	4.5	4.8	7.2	4.7	4.7	4.9	5.3
10449 NCTC	6.4	4.4	6.9	6.9	4.3	4.5	4.5	6.6	4.5	4.6	4.8	5.0
SL-1	6.5	4.3	7.0	7.0	4.5	4.5	4.8	6.9	7.0	7.1	4.7	5.2
6715-10	6.5	4.4	6.8	6.8	4.6	4.6	4.9	6.9	6.8	6.9	4.9	5.2
Control**	6.4	6.4	7.4	7.4	7.3	7.0	7.1	6.9	7.2	7.5	7.4	7.3

*Filter sterilized - cellobiose, galactose, maltose, mannose, and trehalose were also filter sterilized

**pH recorded from a single tube